

Prominent among the Tintic mines is the Mammoth, situated near the junction of contact of the limestone and the granite on the western slope of the Mammoth Hill, at an altitude of about 7,000 feet above the level of the sea. The Mammoth ore deposit is a true fissure vein in the silurian limestone; this limestone is crystalline and siliceous. The gangue or vein-material is brecciated quartz.

The Mammoth is remarkable for its dimensions as well as the great value of the ore extracted, which is chiefly carbonate of copper and oxides of copper, carrying a high percentage in gold, silver and copper.

The mine is largely developed. The shafts have been sunk to a depth of 300 feet, at which point they are intersected by a tunnel, from the tunnel a winch has reached a depth of 200 feet. Levels, drifts, inclines and cross-cuts have developed the lode in various directions, exposing a deposit sixty feet in width, containing over \$10,000,000 worth of ore in sight, as actually established by measure. The plant of the Mammoth mine consists of fourteen furnaces, twenty-six reverberatory furnaces, crushing and refining works, possessing a capacity for the conversion or separation of 200 tons daily of the mixed copper, silver and gold ores of Tintic. The daily production of the mine should and could average \$10,000, netting an annual profit of at least \$2,000,000 to the owner. Cremon Mammoth, largely developed, ore rich in gold, silver and copper.

The mines of Eureka Hill in the northern part of Tintic are next in prominence, forming a series of veins and deposits in the silurian limestone. This limestone is tilted up. These deposits form on a large fissure vein, subdivided into a series of veins, irregular in strike and dimensions, by strata or beds of limestone. These veins are concealed by numerous feeders and spurs. The character of the ores extracted is gray carbonate of copper, rich in a considerable percentage of gold and silver. In past times rich deposits of horn silver have been found in the mines in Eureka Hill. Foremost among these mines are those owned by the Eureka Hill Mining Company, of which said company J. Y. Packard is the head and principal owner. The property comprises several mining locations, is extensively developed to a length of 6,000 feet and 400 feet in depth. The sinking of the main shaft is done by steam drill, and the hoisting by a fifty horse power steam engine. The mine produces well and steadily.

Immediately north of and adjoining to the Eureka Hill Company's mines are the properties known as the Bullion, Beck, Champion and Crown Point. These mines, embracing in length 4,200 feet, and in width 300 to 200 feet of valuable mineral bearing ground. These mines are developed extensively by shaft, tunnels, drifts and levels to a depth of from 150 to 300 feet, and an aggregate of over 2,000 feet in length. The main vein is from a few inches to twelve feet wide, containing ore which assays 30 per cent. lead and 80 to 300 ounces in silver per ton. The present daily production is about twenty tons of good ore, but will undoubtedly soon be larger. The character of the ores extracted is galena and carbonate of lead.

The Julian Lane is a paying mine. The ore contains silver and blanch; developed to a depth of over 300 feet. The Victor, Kohncor and California mines are working on the same veins as the Julian Lane. There are also of note the Joe Bowers, Gold Hill, May Flower, Silver Spar, Rising Sun, Shower, Brigham, Udine, Shoebright, Mary Bell, Southern Belle, Cornucopia, Argentina, Liberty, Hidden Treasure, Kentucky Jay, Silver Wing, Estella, Elmira Ray, Gemini, Reverse, Montana, Independence, Isabella Victoria, Swan, Ocean, Robbins, Golden Treasure, Diamond, Maubattan, Albert Paul, B. B. Tail, Mormon Chief, Aspinwall, Coma, Wyoming, Centennial Eureka, Godiva, Black Rock, Cross Dragon, Conter, Eliza, Governor, Brooklyn, Ridge, King James, Lady Aspinwall, Limited, West Bullion, Red Rose, Red Bird, Golden King, Young Mammoth, Jenkins, Three Ply, Silver Coin, Zulu, Valley, Midgley, Black Jack, Voltaire, Alpha, West Eureka, Key Stone, Tailman, Eclipse, Iron Cloud, North End, Butcher Boy, Wild Rose, Sunbeam, Pacific Bismuth Chief, Lily of the West, Merrimac, Iron Queen, Morning Glory, Susan, North Star, Black Dragon. All the aforesaid mines have been more or less largely developed, and have good prospects for the future. Two and a half miles north-east from Eureka Hill is the Tintic Mining and Milling Company's property, consisting of a ten stamp mill and all the necessary appurtenances thereto; the ores are worked by the dry crushing process and are chloridized before amalgamation. In the vicinity of Silver City are situated a number of iron mines, which are shipping iron ore to the Franklin and other smelting works, to the amount of several hundred tons daily. These ores are peroxides and sesquioxides of iron or hematite, occur in strong veins, assaying 60 to 70 per cent. of iron and \$5 to \$15 value in gold and silver per ton. These ores are principally found in Tintic as bedded deposits in the silurian limestone; they are not suited for any other purpose than flux on account of their containing other minerals. These iron deposits are the sure indicator and apex of

other gold, silver and lead bearing deposits and verify the old German saying: Es ist kein Gang so gut, Oder Er hat einen eisernen Hui!

CAMP FLOYD MINING DISTRICT.

This district comprises four miles south of Ophir (Bas Canyon) and about thirty miles southwest of Salt Lake City; situated in the Oquirrh mountain range.

The principal mines are situated around Lewiston, near the summit of and on the western flank of the Oquirrh range, and produce free milling ore, which appears in and is hereditary to a quartzite bed, which bed overlies the older limestone. This limestone comprises the centre of the great upheaval in this part of the Oquirrh range. The lower part of the limestone overlies the shale and quartzite beds, and belongs with them to the silurian age. The older lime beds occupy a space of about 1,200 feet between the quartzite beds. It is very difficult to determine the exact point where the devonian and carboniferous beds commence, but it is certain that all the beds in which the ore containing quartz appears belong to the silurian age.

The lower limestone is compact and crystalline, of a dark gray color, shows few fossils and such as are found, as corals and mollusks, are so changed by crystallization that their species can only be determined by the most careful examination.

The ore-bearing quartzite beds have a thickness of nineteen to sixty-eight feet. They have a hard limestone floor, and a roof of calcareous shale, sandstone and cherty limestone, alternating, and are in their structure and appearance entirely different from those underlying the quartzite. The shaly limestone is rich in fossils of the devonian and carboniferous ages.

The character of the silver-bearing zone or belt of quartzite is very peculiar and different in every way from a true fissure vein structure, but it shows a distinct stratification of ordinary sandstone or quartzite bedded, and is conformable to the bedding of the country rock throughout the whole district, the hanging wall being a calcareous lime-shale and the footwall a dark gray limestone. These distinct lines of the quartzite bedding disappear only where the bed is crushed or brecciated by the upheaval, which fact must appear clearly beyond dispute to every careful observer.

This quartzite bed is a permeable stratum of sandstone, made crystalline and vitreous by the heated vapors and chemical reagents from below, before and during the gradual upheaval of the antediluvian ridge; the overlying shale bed being impermeable, the mineralized vapors were confined to the permeable and porous sandstone, changing the same slowly into true quartzite, and depositing the silver, antimony, cinnabar, lead and copper ores in the same.

From this will be seen that the richest ore deposits will be found there, where the quartzite is most broken and crushed under the influence of the upheaval, as the penetrations of the mineral solutions at those points are the easiest.

By a close examination of the rock in the crushed quartzite, deposited together with the ore, it will appear that the ore forms, in many cases, only a coating of the fragments, the interior being more or less barren, which indicates the process of depositing ore, continued also, subsequent to the upheaval.

There is no reason why impregnated beds formed by sublimation, as the above mentioned ones, should not be as rich, valuable and extensive as any other ore beds. Copper and other ores are found as impregnations in various countries, as in Germany, Japan, China and California. Gold is found in China and Japan in beds of slate, which are entirely impregnated with iron, copper and lead sulphurets.

The principal mines are the Sparrow Hawk, London, Marion, Geyser, and others of the Camp Floyd Silver Mining Company.

These mines are largely developed by numerous shafts, inclines, drifts and adits, and have produced a great amount of silver, which would have been made more profitable if the early management had been more judicious.

The Carrie Steele is largely developed, showing large quantities of rich ore.

The Queen of the West, Silver Cloud, Silver Beld, Antelope, Jenny Lind, Lewiston, Last Chance, Camp Douglas, Silver Star, Reno, Leopard, Silver Circle, Wandering Boy, Star of the West, Midway, Emery, Black Hawk, Gentle Belle, Mormon Chief, Grecian Bend, Meross, Alexander and New Idria No. 2, are all promising mines, having all been more or less extensively developed and ore-producing.

OPHIR AND RUSH VALLEY MINING DISTRICTS.

In Ophir and Rush Valley districts are situated on the western slope of the Oquirrh range, occupying a very large tract of ground of about 200 square miles. Rush Valley mining district commences at about thirty-four miles south of Salt Lake City. Ophir mining district adjoins Rush Valley upon the south line. The formation of country rock in these districts is principally limestone, and appears everywhere in strata, cliffs, reefs and ledges. These strata of limestone dip with the slope of the hills toward the valleys, losing their course gradually in the great upheaval. Through this limestone break Silverado, East, Dry, Soldier, Spring and other can-

yons, are so many large channels formed by the great ancient water-courses and upheavals, leaving the broken lines of the strata on either side of the channels facing each other, and so appearing as monuments, clearly indicating the positions which they once occupied in remote ages, and at the same time convincing the geologist of the great upheavals which have taken place here.

We will observe, that if it were in our power to press back those hills to their former positions to a level with the valley, that all those broken and disjointed lines would be brought together, forming again one whole and continuous line of stratification.

It would appear that prior to the upheaval, the country, as a more or less horizontal plane, was covered by a huge mass of limestone, 1,500 to 2,000 feet in thickness, and when the mighty subterranean powers exerted themselves in their united efforts, pressing upward, they broke and upheaved the whole enormous mass of limestone and formed hills, canyons, gulches and ravines, like those we see at the present time, rising in solemn grandeur, and towering with their snow-capped heads high up among the clouds, with this difference, that at remote ages they appeared grander still; not having undergone the influence of water and air. Quartz and quartzite are next to limestone, the most frequent in these districts. All the gangue and vein matter are highly silicious.

North of Ophir City are huge cliffs of quartzite running south-west and north-east, crossing the northern gulches and ravines across Rush Valley, above and past the Quarry and Honerin toward and past the Lion No. 2 mines. Quartzite carries the richest ore on the Horn Silver Hill. Overlying the quartzite is slate, schale and schist, and last limestone.

Dolomite, or magnesian limestone appears in Ophir City as a belt west of the Chicago and Hidden Treasure mines, and forms in Rush Valley district the deposit of some of its best producing mines.

Granite appears at the head of East Canyon and also east of Stockton, on the main divide of the Oquirrh range. In the eastern part of Rush Valley district granite is more prominent. Of porphyry there is one main belt in each district. The Ophir belt, or dyke, runs from Lion Hill over Ophir, Shoo Fly Hill and across the eastern flank of Mahogany Hill toward Rush Valley district, forming a dyke about 160 feet wide. This dyke commences north-west of Silver Shield Hill, near the Roaring Lion mine, running north-east to the summit of the divide, near the Sacramento mine, thence northerly through Treasure Hill, across the Mono mine, thence across the eastern flank of Mahogany Hill toward Rush Valley district. East of the Mono, a branch or blowout of the main dyke runs down the western flank of Shoo Fly Hill toward Jacob City.

This porphyry appears here and there, from 10 to 15 feet above the surface in grotesque forms, spires and pillars; at other places, as in the vicinity of the Sacramento mine and in Treasure Hill, it quite disappears for some distance below the surface.

In Rush Valley district we observe a belt of granitic porphyry running in a northeasterly direction, crossing in its course the Iniquity, Silver Star, Muscadine, Atkins, Great Basin, First National and other prominent mines on St. Patrick's hill. Schale and schist form in Ophir district the hanging wall of nearly all the main ledges. Spars of all the silicious calcite and magnesian varieties abound everywhere as gangue, or vein matter, and as stalactites and stalagmites in caves and crevices. The great upheaval has produced in the Oquirrh range a perfect anticlinal curvature of the sedimentary beds, of which the longitudinal axis is north and south.

About 800 or 900 feet north of East Canyon by Ophir City this anticlinal curvature is broken through from east to west, and shows in this break a dislocation or slip of the beds in an almost perpendicular direction, to an extent of from 200 to 300 feet. North of this fault, the country forms a sharper curvature than south of the same, showing in this a greater uplift in the flanks. On the north side a deep ravine cuts through the beds, following the centre line of the upheaval and enters the canyon by Ophir City. In this ravine the quartzite and slaty schist underlying the limestone is exposed for a considerable distance. This quartzite and slaty schist belong to the lower silurian age, which is determined by fossils found in the shaly beds. In these fossils we recognize modiolopsis modiolaris, palatrina echinata, ambonychia radiata, orthona parallela, arcula demissa, modiolopsis orthona, lingua cunata, (conchifer) dalmatiana humulosa, (crustacea) zaprentis bilateralis (radiate) and others, from which fossils we recognize several species of trilobites, conifers and crinoids.

The general course of the mineral belt in Ophir and Rush Valley districts is north-east and south-west, and about two miles wide. All or most of the veins run at right angles, that is, north-east and south-west in the belt. This belt commences in Tintic, and runs over Greeley Springs, Camp Floyd, Ophir, Jacob City and Soldier Canyon for about three miles north-west of Stockton. Further north-west it has not been traced. The ores are divided into smelting and milling ores; the first predominate and comprise gal-

ena, carbonates, chlorides and sulphates, ochreous earth constitute the majority of the vein material, as a result of the oxidation of argentiferous minerals containing arsenic and antimony. The most characteristic ores are galena, cerussite (carbonate of lead), bornsilver and silver glance. The components of the ore are numerous and comprise galena, sphalerite, pyrite, jamesonite, argenteite, stephanite, cervantite, boulangerite, minette, limonite, anglesite, linarite, wad and koolin.

THE LEADING MINES IN OPHIR.

Hidden Treasure: the ore occurs in large bodies; thirty tons per day is the general daily average produced by a working force of seventy-five men, from the mine leads a tramway 1,200 feet long down the hill to the wagon road. The mine is extensively developed to a depth of more than 1,400 feet on the dip of the vein.

The Chicago works on the same ore body as the Hidden Treasure, is largely developed and has produced in past years large quantities of excellent ore.

Each of the aforesaid mines has a smelter, the Waterman and the Ohi ago, situated nine miles distant on Rush Lake to work their ores.

The Mono is developed by an incline from which runs an east and west branch incline to a depth of over 800 feet; this mine has produced very rich ore in the past and is a valuable property.

The Queen of the Hills, developed by an incline to a depth of over 1,500 feet, and by thousands of feet in drifting east and west on the vein.

The Keatsarge, owned by Sam Conner & Co.; vein two to five feet wide, developed to a depth of 900 feet and on the strike by over 1800 feet of drift and level. Vein dips at an angle of inclination of 25 degrees from the horizontal; character of the ore is chloride of silver, tellurium and bornsilver, assaying from \$60 to up in the thousands per ton.

Last Chance, Wild Delirium, Burnett, Bannock, Indicator, Silver Treasure, German, Home Stake, Rattler, Galena, Etna, Monument, Swaneia, Ira, Northern Light, Ivanhoe, American Flag, Jennie, Azure Queen, Emille, Pine Grove, Belfast, Empire, Trace, Banner, Russian, Arabella, Selah, Dixie, Moysan, Gas Light, Struck it, San Joaquin, Chris opolis, Green Chloride, Fourth of July, Magnolia, Jim Fiek, Green-eyed Monster, Chloride Gem, Mountain Gem, Miami, Shamrock, Boston Pet, Hattie Evans Aristotle, Saint Louis, Utah Queen, Converse, Tiger, Rockwell, Elgin, Brooklyn, Gray Eagle, Vesta, Noyes, Henrietta, Sevier, Trafalgar, Cooley, Wandering Jew, Crusader, Red Pine, Pochontas, Poor Man, Deseret, Shoo Fly, I. X. L., (Grecian Bend, Herschel, Accident, Thad Stevens, Eureka, Miners' Delight, Lily Rose, Gray Rock, Blue Rock, Buck Horn, California Boy, Roland, Great Western, Flavilla, Plymouth, Mahogany, Zella, Sacramento, Sunnyside, Mountain Tiger, Silver Chief, Roaring Lion and the Bechtel are all mines of note with great hopes for the future, and are all more or less extensively developed.

The principal mines in Rush Valley are: Honerin, Great Basin and Quarry are extensively developed to a depth of over 900 feet and over 1,000 feet on the strike.

First National, developed to a depth of 500 feet; and Lion No. 2; developed to a depth of over 300 feet and by numerous tunnels, drifts, shafts and stopes, the above mines having produced thousands of tons of good and valuable ore.

Silver King No. 1, and 2, and Southport, developed to a depth of 500 feet by numerous inclines, drifts and stopes, disclosing large quantities of low grade ore. Silver Queen, Minerva, Bullion, Elizabeth, Katherine, Alps, No You Don't, Muscadine, Clara, Merwin, Leonora, King of Stockton, Iroquois, Hannah, Delancey, Globe, St. Patrick, Legal Tender, Argenta, Protector, Calumet, Sentinel, Metropolitan, Vulcan, Hecla, Daniel Webster, Silver Crown, Theresa, Emerald, Melia, War Eagle, Chuaco, Commodore and Montezuma are prominent mines and are more or less developed and ore-producing.

WEST MOUNTAIN MINING DISTRICT.

Last, but not least, comes the so-called Old Reliable or West Mountain mining district. This district commences about twenty miles southwest of Salt Lake City, and is situated on the eastern slope of the Oquirrh range.

The principal geological structure of this district is quartzite or vitreous sandstone, and dolomite, or magnesian limestone. The quartzite appears in beds of great dimensions with thin seams or bands of shale which separate the strata at intervals of from 100 to 500 feet. In the southern, southwestern and southeastern portions of the district, two beds of limestone from 100 to 300 feet in thickness are observable from the southeast in most irregular foldings and frequent dislocations of the strata which at present show a general strike of northeast and southwest and dip north west at angles varying from 20 to 80 degrees. In several of the breaks and faults, large dykes of dioritic and hornblende, porphyries appear. They are extraordinary, frequent and well defined in the southern and southwestern parts of the district. The presence of these igneous rocks occupying the breaks of the strata, verifies the origin of such disturbances as have upheaved, folded and broken the sedimentary beds. Ore deposits appear in this district:

As beds between the strata forming bed or strata veins, examples of

which are, Old Telegraph, Spanish Hill, American Flag, Utah, Jordan, Neptune, Revere, and others appearing and situated all in one belt.

As contact veins between limestone and quartzite, limestone and shale, quartzite and shale, eyonite and quartzite, eyonite and limestone. To this class belong the Jordan, Neptune, Grizzly, Ashland, Winnamuck and others.

As true fissure veins in the syenitic porphyry such as appear at the head of main Bingham canyon beyond the Jordan and Neptune mines; also as true fissure veins in the diorite, diorite and eyonite, porphyry in Black Jack gulch, examples of which are Bemis and Hiatt, Queen, Old Times, New Times, Boston, Russell, Fisher, Badger, French Spy, Summit, Red Cloud, Liberty, Louis, Zuni, Monterey, Ocasola, and Lucky Boy, Black Jack and Opulent mines, these veins carry ruby and wire silver.

As fissures or gashes breaking through the strata to which a great number of the Bingham ore deposits belong. It would take too much time and space to explain the nature, character and merits of the different classes of ore deposits to their fullest extent and meaning in this paper. The quantity and quality of ore are the only standard of value for the miner and capitalist.

As beds and contact veins must necessarily conform in strike and dip to the enclosing stratum with all its foldings, slips, distortions and disturbances of any kind incidental to the upheaval of the same folded into anticlinal, and synclinal curvatures, so it will clearly appear that the strata are the true guides of the bedded veins at any point along the course of the same.

Syenite, diorite, diorite and granite appear first, at Black Jack gulch, and Butterfield canyon, and again at the head of main Bingham canyon and extend over the divide into Tooele county in a westerly direction.

The ores in West mountain mining district appear principally as galena, carbonates and sulphurets of lead, oxides of copper, ruby silver and free gold. The latter is found in the alluvium and occasionally in small quantities with the ore.

The impurities in these ores are pyrites of iron, pyrites of copper, decomposed pyrites, oxide of iron and arsenic. The percentage of the ore varies from 12 to 120 ounces in silver, from a trace to \$30 in gold and from 30 to 50 per cent. of lead per ton.

THE PRINCIPAL MINES.

The Old Telegraph, comprising the No You Don't, Nez Percés Chief, Montreal and Grecian Bend mines. This mine could at present be the most productive. The vein is at places over forty five feet wide, presenting a solid breast of ore. The mine produces at present, with a force of twenty men, twenty tons of ore daily. The production could easily be raised to triple that amount. The timbering of the mine is all that it could possibly be. The greatest depth attained is 400 feet. Jordan is situated westerly of the former, owned by the same company as the Old Telegraph in the past. This mine is very extensively developed and has produced great quantities of ore.

Revere, situated easterly of the Old Telegraph and working on the same vein, has attained a depth of over 800 feet on the vein. Eight levels have been run east and west, 100 feet apart. Thousands of tons of low grade ore are in sight. The mine for the last year has produced at an average twenty-five to thirty tons of ore per day, and produces now with twelve men about fifteen tons daily; assay 30 to 45 per cent. lead, 10 to 25 ounces of silver per ton.

Attached to the aforesaid mines are the Jordan Smelting and Concentrating works, consisting of six furnaces and concentrating works, situated on the Jordan river near the junction of the Utah Central with the Bingham Canyon railroad. The company has at the mine a steam saw mill.

Yosemite, situated east of the Revere, produces, with a force of thirty-five men, about 400 tons of ore per month. The mine is largely developed. The ore averages 50 per cent. of lead and 20 ounces of silver per ton.

Spanish, situated between the Jordan and Old Telegraph; this mine has produced large quantities of ore and is developed by about 28,000 feet of tunnels, drifts, inclines and stopes. The ore is concentrated at the mine. Neptune and Kempton, situated southwesterly of the Jordan. These mines are developed by about 29,000 feet of inclines, tunnels and drifts. The main tunnel is over 600 feet long and connected by a long level on the vein with the main incline which is over 400 feet deep. The mine has produced in the past large quantities of ore and produces at present the finest and best ore of the district.

The Stewart gold mines disclose an enormous body of gold ore to a depth of over 200 feet, the body being from 80 to 400 feet wide, averaging 8 to 10 dollars per ton. Attached to the mines are two 10-stamp mills.

The Atlanta, San Francisco and Irish American tap four veins with a 900 foot tunnel at a depth of 600 feet.

The Lead mine has opened an enormous body of galena and carbonate of lead ore; employs thirty to sixty men making rapid and extensive developments. The main ore body is from 60 to 100 feet wide containing low grade carbonate ore, of which ore 50 tons are reduced in the Lead mine concentrating works to twelve tons of ore assaying 62 per cent. lead and 6 to 10 ounces in silver. In what was for a long time supposed to be the footwall, milling ore has been found lately, assaying 1 per cent. lead

and 40 to 300 ounces in silver. The principal works of the mine run towards the Yosemite mine at a rapid rate under the able superintendence of N. Treweek. Attached to the mine is a good boarding house. From the mine to the mill a tramway four and one half miles long conveys the ore. At the lower end the cars dump into the top of the mill one hundred feet above the point where the ore leaves as concentrated ore. In entering the mill, the ore dumps over the grizzlies (grates) separating the coarsest, the same falling on a slide and the finer going to and through the rock breakers from here to the Cornish rolls, thence through five revolving screens, one below the other. These screens have each a collecting fan, from which a spout runs to the jiggers. These jiggers have the usual varying stroke and size of screen to suit the size of the ore; they have a velocity of 500 to 450 revolutions per minute and a stroke from 7-12 inch to 1-18 inch. What is called the slums or tailings go to the slum tables, and the hearth settling table and finally through a jigger constructed for that purpose.

The mill is operated by steam, employing thirteen men for two shifts day and night. True fissure, extensively developed; the lower tunnel taps the vein at a depth of 500 feet and is 410 feet long at that point. The vein is eighteen inches to five feet wide, contains galena, carbonate of lead, and in the upper workings, black sulphurets. The True Fissure mine is one of the Old Reliable's coming Treasure chambers.

The Tiewaukie and Accident mines have opened a large ore body extensively developed, carrying galena, bornsilver and wire silver.

The Winnamuck and Dixie mines and smelting works belong to a Holland company, and are situated just below Bingham. The mines are developed by over 40,000 feet of tunnels, shafts, inclines and drifts; they are among the oldest mines of the district and have produced immense quantities of ore.

The Queen, Bemis and Hiatt, Chubb, Monterey, Russell, Boston, Arthur, Garfield, Fisher, Badger, Louis, Zuni, New Times, Summit, Liberty, Red Cloud, French Spy and extension, Northern Chief, Nellie, Eagle Bird, Opulent, Lucky Boy and Black Jack are extensively developed by tunnels, drifts, inclines and shafts, disclosing to the eye large bodies of ruby silver and gold ore, valued at from \$20 to \$300 per ton.

The tunnels are from 200 to 1,100 feet long, tapping the lodes at depths from 100 to 1,000 feet. These mines are situated in a formation of diorite, diorite, and syenitic porphyry.

Prominent among the other valuable mines are the Martin, Burning Moscow, Agnes, Sacred, Rain Bow, Live Yankee, Rough and Ready, Last Chance, Ashland, Live Pine, St. John, Gray Eagle, Bull Boy, Aladdin, Albino, Bull Dezer, Saginaw, Ozyhee, American Flag, Grizzly, Northern Light, Utah, Savage, Bret Hart, Grecian Bend, Miners Home, Bickney, Bullion, Dixon, Sturge, Henrietta, May Flower, Levant, Sunrise, Sunset, Washington, Melissa, George, Red Warrior, Roman Empire, Wide Awake, Tiger, Queen of Sheba, Ely, Vespaian, Western Chief, Winebag, Yampa, Flics, Montana, Silver Shield, Merrimac, Grand Cross, Alameda, Fanny Bemis, Giant Chief, Victor, Miners Dream, Jersey, Royal, Old Bull, Hydaspes, Canby, Henry M. Darnmouth, Kanosh, Trinity, Hamilton, Honest Abe, Fulare, Arizona, Hampton, Wide West, True Fissure, Silver Maid, Portland, Providence, Star of the West, Omaha, Green Grove, Knickerbocker, Murray, First Chance, Evergreen, Eagle Bird, Vanderbilt, Mountain Gem, Horace Greeley, Nick of the Woods, Ocasola, Lucky Boy, Elvina, Constitution, Gold and Silver, Croesus, Red Rover, Edison, Bobtail, Gold Crown, Amanda, Overland, Ingersoll, O. K., Lily, Baby, Mill Creek, St. Bartholomew, Col. Sellers, Mighty Dollar, Apex, Golden Era, Fairview, Henrietta, No. 2, Keep a Picking in, Rabble Snake, Ocaso, Phoenix, Kitty, Colorado, February, Kling Moon, Peabody, Black Hawk, Noonday, Torpedo, Amazon, Brilliant, Parker, Chicago Fire, Mystic, Maple Tree, Alamo, Extension, Albino, Allice, National Greenback, Champions, Domingo, Flyer, York, Parma, Roman, Venus, Monitor, Tilden, Benton, North Star, George, Howard, Veto, Centennial No. 2, Bazooka, Sarah, Nast, Prince of Wales, Queen, Flora, Florence, Silver Giant, Hooper, Railroad, Hoogly, Saint James, Elephant, Williams, Commercial, Grand Duke, Grand Dutchess, Old Hickory, Central City, Accident, Ashton, Quakingasp, Stanley, Parvane, Hibernia, What Cheer, Salt Lake, Caledonia, Gibbons, Buffalo, Eclipse, Backer, Stevenson, General Shelby, Thomas Jefferson, Fabian, Dividend, Alta, Toronto, Austen, Flint, Utra, Granite State, Pay Roll, Yankee Blade, Dalton, Nina, Fraction, Carbonate, Rustin, Charles Dana, Southside tunnel and many others to the number of 130 mines.

I must not fail to mention the placer mines of this district which produce considerable gold and average from \$3 to \$9 per day to the man. The principal placer mines are in the main canyon and in Bear gulch.

COAL.

At Coalville, six miles south of Echo, on the Union Pacific road, is a number of seams of coal from one to seven feet in thickness. From these are produced large quantities of coal, used on the Union Pacific.